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IS 7593-1 (1986): Power-Operated Pneumatic Sprayer-Cum-Duster, Part 1: Knapsack Type [FAD 21: Farm Implements and Machinery]



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IS : 7593 (Part 1) - 1986

Indian Standard

SPECIFICATION FOR
POWER-OPERATED PNEUMATIC
SPRAYER-CUM-DUSTER

PART 1 KNAPSACK TYPE

(*First Revision*)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR POWER-OPERATED PNEUMATIC SPRAYER-CUM-DUSTER

PART 1 KNAPSACK TYPE

(First Revision)

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AMENDMENT NO. 1 OCTOBER 1995
TO
IS 7593 (Part 1) : 1986 SPECIFICATION FOR
POWER-OPERATED PNEUMATIC
SPRAYER-CUM-DUSTER
PART 1 KNAPSACK TYPE

(First Revision)

(Page 6, clause 4.1, line 2) — Substitute ‘5.1 of IS 12482 : 1988*’ for ‘B-3 of IS : 5135 (Part 1) : 1974*’ with corresponding title in foot-note as ‘*Method of test for manually operated dusters’.

(Page 8, clause 5.8.1, line 2) — Substitute ‘7.3 of IS 10134 : 1994†’ for ‘6.3 of IS 10134 : 1982†’ with corresponding title in foot-note as ‘†Method of test for manually operated sprayers (*first revision*)’.

(Page 9, clause 6) — Add a new clause after 6.3:

‘6.4 Supply Conditions — If required by the purchaser the manufacturer may supply the unit without the accessories required for duster/sprayer. In such cases the provision for converting the sprayer to duster and *vice-versa* shall be provided and the unit be tested for all the requirements of the standard.’

(Page 10, clause 9.1, line 3) — Substitute ‘IS 7201 (Part 1) : 1987*’ for ‘IS 7201 : 1974*’ and corresponding title in the foot-note as ‘*Methods of sampling for agricultural machinery and equipment : Part 1 Hand tools and hand operated/animal drawn equipment (*first revision*).’

Indian Standard

SPECIFICATION FOR POWER-OPERATED PNEUMATIC SPRAYER-CUM-DUSTER

PART 1 KNAPSACK TYPE

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part 1) (First Revision) was adopted by the Indian Standards Institution on 20 August 1986, after the draft finalized by the Crop Protection Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 This standard was first published in 1975. While implementing this standard a number of difficulties were experienced by the testing authorities and the manufacturers. Hence a need was felt to revise this standard. This revision incorporates the modifications suggested by testing authorities and the manufacturers. Advantage has also been taken to update this standard regarding terminology, material and method of testing, and incorporating the Amendment No. 1 to 5.

0.3 The concerned committee also decided to specify the requirements of knapsack type and stretcher type pneumatic sprayers only, as the barrow type sprayers have become obsolete. This part covers the requirements of knapsack type sprayers. The other part would cover the requirements of stretcher type pneumatic sprayers.

0.3.1 The figure given in the standard is meant only for the illustration. This shall not be considered as suggestive of any standard design.

0.4 While revising this specification, the committee was fully aware of necessity of prescribing the distribution pattern and droplet size of spray liquid. It was felt that the existing test procedure needed elaboration and specificity. Furthermore, reliable data on the basis of standardized method of test on a larger number of sprayers shall be collected before the limit would be prescribed in this standard.

- 0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.
-

1. SCOPE

1.1 This standard (Part 1) prescribes the material, performance and other requirements of power-operated knapsack type pneumatic sprayer-cum-duster for spraying the pesticides in liquid form and convertible into duster for dusting the pesticides in powder form.

1.1.1 The sprayer of this type is popularly known as mist blower.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions, in addition to the terms defined in IS : 8480-1977†, shall apply.

2.1 **Knapsack Sprayer** — A sprayer which can be mounted on the back of an operator for spraying.

2.2 **Power-Operated Sprayer-cum-Duster** — A sprayer which is convertible into a duster and vice-versa and with an engine as a source of power.

2.3 **Total Tank Capacity** — The volume of the tank to its neck level, the tank being equipped with all its internal mountings, if any.

2.4 **Total Mass** — The mass of the whole unit without liquid or dusting powder as ready for operation including discharge line for spraying or dusting whichever is heavier and prime mover without fuel and starter (if of rewind type).

3. MATERIAL

3.1 The recommended material for construction of different components of sprayer-cum-duster except prime mover is given in Table 1. The material should, as far as possible, conform to the relevant Indian Standard. Some of the relevant Indian Standards are given in Appendix A for guidance.

3.2 All the metallic parts coming in contact with the pesticides should preferably be of the same material to minimize electrolytic potential

*Rules for rounding off numerical values (*revised*).

†Glossary of terms relating to crop protection equipment.

TABLE 1 MATERIAL OF CONSTRUCTION OF VARIOUS COMPONENTS

(Clause 3.1)		
SL No.	COMPONENT	MATERIAL
(1)	(2)	(3)
i)	Tank	Fibre glass reinforced plastics Plastics
ii)	Lid or cap	Fibre glass reinforced plastics Plastics
iii)	Frame	Mild steel
iv)	Impeller	Mild steel Galvanized plain steel Aluminium alloy Fibre glass reinforced plastics Plastics
v)	Casing	do
vi)	Air bent outlet	Galvanized plain steel Plastics
vii)	Air hose	Rubber, fabric braided Rubber, synthetic Plastics
viii)	Strap	Leather, vegetable tanned Woven web cotton Yarn, synthetic
ix)	Strap buckle	Mild steel Galvanized plain steel
x)	Cushion	Foam rubber Foam plastics
xi)	Gasket	Rubber, synthetic PVC Leather Fibre Brass Plastics
xii)	Air pressure regulating device	Plastics
xiii)	Air pressure pipe	Plastics
xiv)	Liquid or dust regulating device	Brass Plastics
xv)	Hose clip	Mild steel Galvanized plain steel

deterioration. The woven web cotton used for straps should as far as possible conform to IS : 7427-1974*

3.3 The material used for different components of the sprayer-cum-duster unit except prime mover shall be indicated by the manufacturer in the parts catalogue (see 6.1)

*Specification for cotton webbing for ammunition carriers and similar other purposes.

4. PERFORMANCE REQUIREMENTS

4.1 Air Output — Air output when tested in accordance with the method given in B-3 of IS : 5135 (Part 1)-1974* at its rated speed, the fan shall be capable of delivering a minimum of 6 m³ of air per minute and the air velocity shall be not less than 60 metres per second.

4.2 Liquid Discharge Rate — When tested in accordance with the method given in B-1, the sprayer shall be capable of discharging from 0.3 to 2 litres of liquid per minute with an adjustable nozzle or a set of nozzles not exceeding 4. The discharge rate shall not differ by more than 15 percent of the declared rate of the nozzle or setting of the nozzle.

4.3 Variation in Discharge — When tested in accordance with the method given in B-2, the variation in discharge due to tank filling at one-fourth, one-half and three-fourths of total capacity shall not exceed 15 percent of the discharge at total capacity of the tank as obtained in B-1.

4.4 Dust Discharge Rate — When tested in accordance with the method given in B-3, the duster shall be capable of discharging a minimum of 0.5 kg dusting powder per minute. The provision for graduations showing $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and full opening positions shall be made.

5. OTHER REQUIREMENTS

5.1 Tank — A tank (see Fig. 1) for holding the liquid shall be provided with the provision of easy conversion into a dust tank. A filling hole of 90 mm minimum diameter if circular or in minor axis if oval, shall be provided on the top of the tank. The hole shall be covered with a cap or lid so that no leakage of the liquid or dusting powder takes place during the mounting of the sprayer-cum-duster and during its operation.

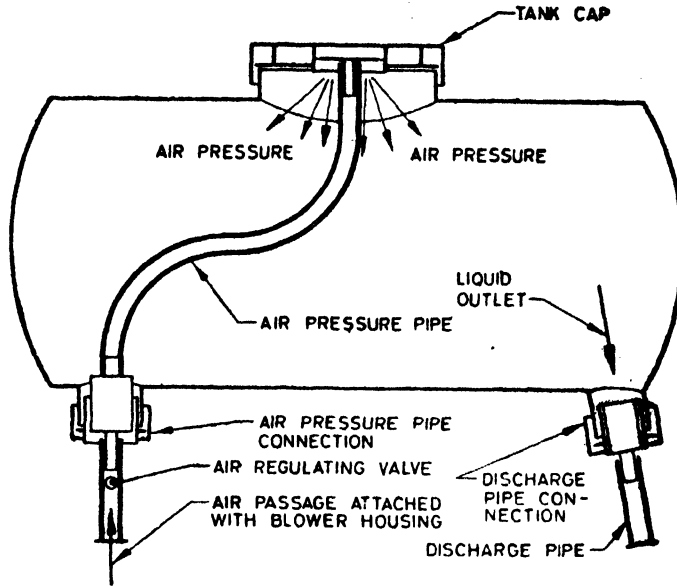
5.1.1 The tank capacity (see 2.3) shall be not less than 0.01 m³ (10 l). The tank capacity shall be declared by the manufacturer. The total tank capacity shall not differ by more than 5 percent of the declared value.

5.1.2 When the liquid or dusting powder is filled in tank up to its total capacity, the tank shall not show any sign of leakage and shall not buckle.

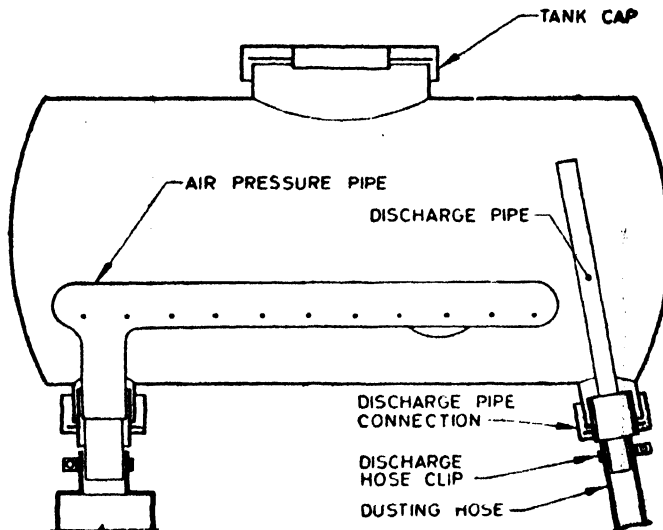
5.2 Impeller — The impeller of the fan shall be dynamically balanced at its rated speed. The impeller shall not touch casing at any point.

5.3 Air Bent Outlet — An air bent outlet may be provided. If provided, it shall be connected with fan casing outlet, air hose and air pressure regulating device.

*Specification for hand rotary duster: Part 1 Belly-mounted type (first revision).



1A Liquid Tank



1B Dust Tank

FIG. 1 COMPONENTS OF TANK ASSEMBLY (SCHEMATIC)

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5.4 Air Pressure Regulating Device — An air pressure regulating device shall be provided while the unit is used for dusting and may or may not be present while spraying liquid.

5.5 Air Pressure Pipe — The air pressure pipe for dust tank shall have perforations and shall be placed in the tank. The pipe at one end shall be attached with pressure regulating device. The pipe may or may not be provided in liquid tank depending upon design.

5.6 Flow Regulator — A device to regulate the flow of the liquid or dusting powder shall be provided.

5.7 Air Hose — An air hose of minimum 45 mm inside diameter and not less than 500 mm in length shall be provided. In case of rubber hose, it shall conform to the requirements as given in IS : 446-1980*.

5.8 Straps — Two straps of not less than 800 mm length after its maximum adjustment and 38 mm width shall be provided in order to help carriage of the unit. Provision for adjustment of each strap shall be made. A cushion of minimum 40 mm width and 20 mm thickness with each strap at least on the portion that rests on the operator's shoulder, and a back rest shall be provided at the option of the purchaser. The back rest may be fitted with a cushion of minimum size of 200 × 200 × 20 mm. The cushions, when provided, shall be covered with suitable materials, such as cotton, canvas, rexin, and PVC or plastic coated fabrics.

5.8.1 The straps and their assembly shall withstand the test prescribed in 6.3 of IS : 10134-1982†.

5.9 Prime Mover — The engine shall conform to the requirements as given in IS : 7347-1974‡.

5.9.1 The exhaust outlet of the engine shall be so positioned that the smoke does not directly affect the operator or crop. At the option of the purchaser, a guard shall be provided on or near the exhaust pipe for the protection of the operator.

5.10 Fuel Control Level — The fuel and chemical discharge controls shall be in easy access of the operator.

5.11 Total Mass — Total mass (*see* 2.4) shall be not more than 13 kg in which the mass of the engine shall not exceed 5 kg.

5.12 Overall Dimensions — Total length without discharge line, width and height of the sprayer-cum-duster including prime mover shall be maximum of 500, 600 and 750 mm respectively.

*Specification for rubber air hose (*third revision*).

†Methods of test for manually-operated sprayers.

‡Specification for performance of small size spark ignition engines.

5.13 An arrangement shall be provided to lift the sprayer-cum-duster for shifting it from one place to another.

5.14 Endurance — The sprayer-cum-duster shall withstand the test prescribed in B-4.

6. OTHER REQUIREMENTS

6.1 Manual — Each sprayer-cum-duster shall be provided with operational and maintenance manual. The manual shall include complete list of regular and optional parts, method of converting the sprayer into duster, instructions for disassembly and cleaning, instructions for routine inspection, adjustments and replacement of parts and instructions for safe handling.

6.2 Spare Parts — Spare parts separately packed for each sprayer-cum-duster according to the number required by the purchaser shall be provided. Even if no demand for spare parts has been made, a set of gaskets, one funnel with a strainer having aperture size of 300 to 425 micron, a measuring cylinder for lubricating oil and a set of necessary tools shall be provided.

6.3 Optional Items — At the option of the purchaser, the following accessories shall be supplied:

- a) A set of spray nozzles for different discharge rates, and
- b) Flame gun.

7. WORKMANSHIP AND FINISH

7.1 All the components of the unit shall be free from burrs, pits and other visual defects which may be detrimental for their use.

7.2 The exposed metallic parts shall have a protective coating to prevent surface deterioration.

8. MARKING AND PACKING

8.1 Marking — Each sprayer-cum-duster shall be marked with the following particulars:

- a) Manufacturer's name or registered trade-mark,
- b) Tank capacity, and
- c) Batch or code number.

8.1.1 Each sprayer-cum-duster may also be marked with the ISI Certification Mark.

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NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

8.2 Packing — Unless otherwise agreed to between the purchaser and the supplier, each unit shall be first packed in a polyethylene bag and then in a wooden case to avoid damage in transit.

9. SAMPLING FOR LOT ACCEPTANCE

9.1 Unless otherwise agreed to between the purchaser and the supplier, sampling of the sprayer-cum-duster for lot acceptance shall be done in accordance with 3 of IS : 7201-1974*.

9.1.1 The classification of different requirements of this specification for the purpose of lot acceptance is given below for guidance.

- a) *Dimensional and Visual Requirements* — 5.1, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9.1, 5.10, 5.12, 5.13, 6.1, 6.2, 6.3, 7 and 8;
- b) *Other than Dimensional and Visual Requirements* — 4, 5.1.1, 5.1.2, 5.2, 5.8.1, 5.9, 5.11 and 5.14.

APPENDIX A

(Clause 3.1)

LIST OF RELEVANT INDIAN STANDARDS FOR MATERIAL OF CONSTRUCTION

- IS : 226-1975 Structural steel (standard quality) (*fifth revision*)
- IS : 277-1977 Galvanized steel sheets (plain and corrugated) (*third revision*)
- IS : 292-1983 Brass ingots and castings (*second revision*)
- IS : 437-1981 Brass tubes for general purposes (*third revision*)
- IS : 410-1977 Rolled brass plate, sheet, strip and foil (*third revision*)
- IS : 617-1975 Aluminium and aluminium alloy ingots and castings for general engineering purposes (*second revision*)
- IS : 1741-1960 Latex foam rubber products
- IS : 2954-1978 Vegetable tanned leather for belting (*first revision*)
- IS : 4170-1967 Brass rods for general engineering purposes
- IS : 4413-1981 Brass wires for general engineering purposes (*first revision*)

*Methods of sampling of agricultural machinery and tractor.

APPENDIX B

(*Clauses 4.2, 4.3, 4.4 and 5.14*)

TESTS FOR POWER-OPERATED PNEUMATIC SPRAYER- CUM-DUSTER, KNAPSACK TYPE

B-1. TEST FOR LIQUID DISCHARGE RATE

B-1.1 Fill the tank of the sprayer with pre-determined quantity of clean water up to its total capacity.

B-1.2 Operate the sprayer at its rated speed and set the nozzle for full discharge. The variation in speed, if any, shall be not more than 5 per cent.

B-1.3 Allow the water to come out through the nozzle. Run the engine till the complete water in tank comes out. Record the starting and stopping time accurately. Calculate the discharge rate per minute.

NOTE — In case it is difficult to drain the tank completely, the discharge rate shall be calculated on the basis of water actually discharged.

B-1.4 Repeat the above test for a minimum of four times and obtain the average discharge per minute.

NOTE — The sprayer should be run idle for some time before commencing the test to avoid initial variation in discharge.

B-2. TEST FOR TANK FILLING VARIATION DISCHARGE

B-2.1 Fill the tank with pre-determined quantity of clean water up to one-fourth of its total capacity.

B-2.2 Operate the sprayer at its rated speed and set the nozzle for full discharge. The variation in speed, if any, shall be not more than 5 percent.

B-2.3 Run the engine till the complete water in tank comes out. Record the starting and stopping time accurately. Calculate the discharge rate per minute.

B-2.4 Repeat the above test for a minimum of four times and calculate the average discharge rate.

B-2.5 Conduct the above test at one-half and three-fourths of the total capacity of the tank.

B-3. TEST FOR DUST DISCHARGE RATE

B-3.1 Operate the duster unit idle for some time to avoid initial variation in discharge.

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B-3.2 Take the mass of the duster unit.

B-3.3 Fill the tank with pre-determined quantity of talc powder used for insecticidal formulations up to its total capacity. The minimum of 90 percent by mass of the talc powder shall pass through the 75 micron IS sieve [see IS : 460 (Part 1)-1978*]. The bulk density after compacting, when tested in accordance with 12.2 of IS : 6940-1982†, shall not exceed by more than 60 percent of the value obtained before compacting.

NOTE — BS sieve 200, ASTM test sieve 200, Tyler test sieve 200 have their apertures within the limit specified for 75-micron IS test sieve.

B-3.4 Operate the duster at its rated speed and set the dust outlet for full discharge. The variation in speed, if any, shall be not more than 5 percent.

B-3.5 Allow the dust to come out through the outlet. Run the engine till the quantity of dust in the tank is reached to about its half of the quantity filled. This could be obtained with the help of the specified discharge rate of the outlet setting. The recording of the starting and stopping time of the duster shall be as accurate as possible.

B-3.6 Take the mass of the unit. Obtain the quantity of the dust discharged giving due allowances to the fuel consumed during the test.

B-3.7 Calculate the discharge rate per minute.

B-3.8 Repeat the above test for a minimum of four times and obtain the average discharge per minute.

B-4. TEST FOR ENDURANCE

B-4.1 Run the unit for minimum 48 hours at its rated speed using water for spraying. The spraying shall be done at maximum setting of the nozzle in case the nozzle opening is adjustable. The period should preferably be covered with continuous stretches of 6 hours duration. In case the prime mover has to be stopped for re-filling fuel in tank and/or water in spraying tank, the period of stoppage should be excluded in accounting the duration for this test. During and after this test, the following shall not occur.

- a) Loosening of the joints and connections;
- b) Any undue knocking or rattling sound;
- c) Any leakage of liquid, dust or fuel;
- d) Any deformation or breakdown;
- e) Any marked wear in any component; and
- f) Any marked vibration.

NOTE — For routine and acceptance check, the unit shall be run for a period of at least five minutes to observe the above points.

*Specification for test sieves : Part 1 Wire cloth test sieves (second revision).

†Methods of test for pesticides and their formulations (first revision).

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